Global Long-Term SeaWiFS Deep Blue Aerosol Products Available at NASA GES DISC

S. Shen[1,2], A. M. Sayer[1,3], C. Bettenhausen[1,4], J. Wei[1,5], D. Ostrenga[1,5], B. Vollmer[1], N. C. Hsu[1], S. Kempler[1]

[1] NASA GSFC, Greenbelt, Maryland 20771, USA   [2] George Mason University,   [3] GESTAR,   [4] SSAI,   [5] ADNET

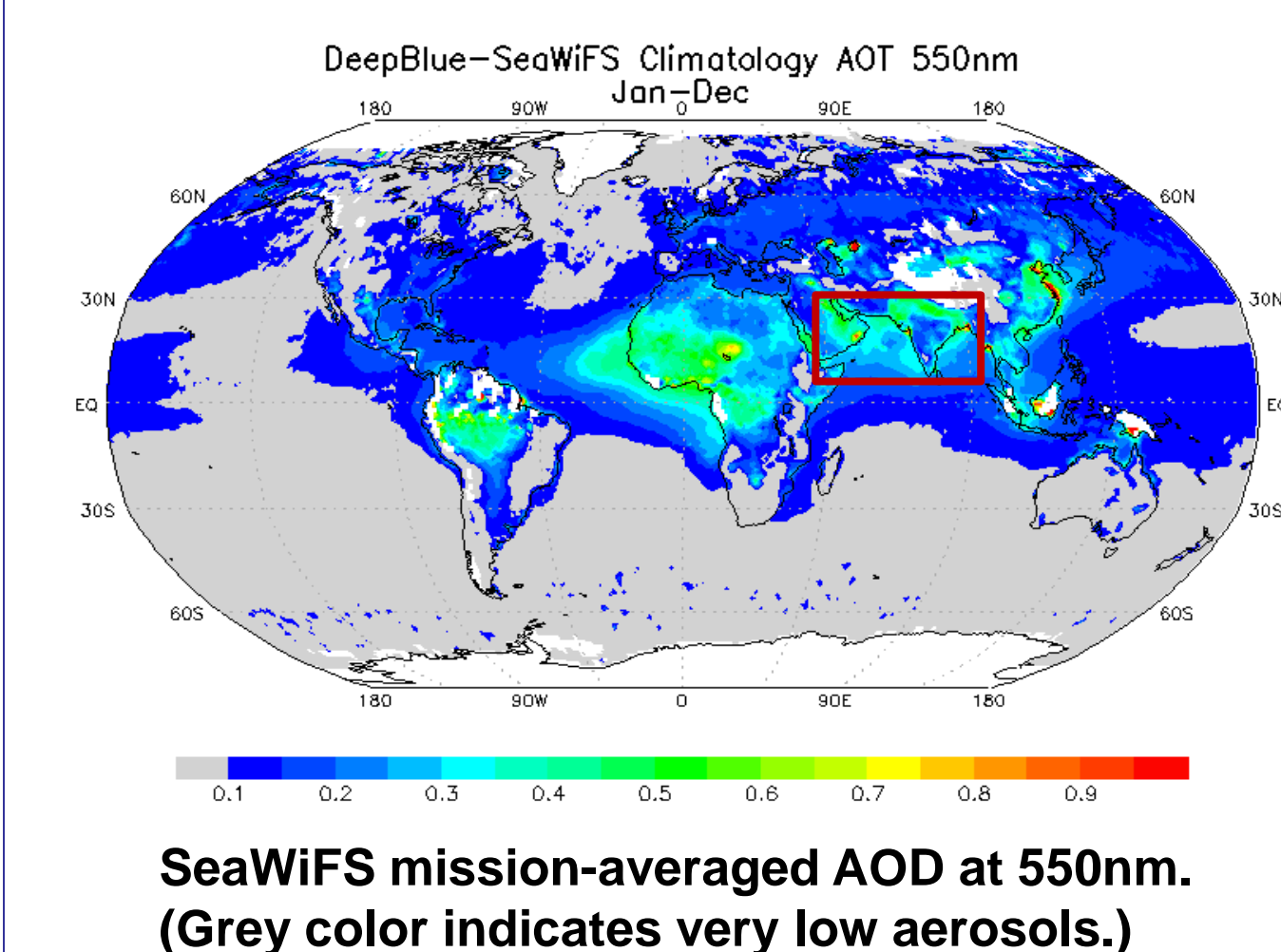## Overview of SeaWiFS Deep Blue Aerosols

Long-term climate data records for atmospheric aerosols are needed in order to improve understanding of air quality, radiative forcing, and for many other applications. The Sea-viewing Wide Field-of-view Sensor (SeaWiFS) provides a global well-calibrated 13-year (1997–2010) record of top-of-atmosphere radiance, suitable for use in retrieval of atmospheric aerosol optical depth (AOD). Recently, global aerosol products derived from SeaWiFS with the Deep Blue algorithm (SWDB) have become available for the entire mission, as part of the NASA Making Earth Science data records for Use in Research for Earth Science (MEaSUREs) program.

The latest Deep Blue algorithm retrieves aerosol properties not only over bright desert surfaces, but also vegetated surfaces, oceans, and inland water bodies. Comparisons with AERONET observations have shown that the data are suitable for quantitative scientific use. [1],[2] The resolution of Level 2 pixels is 13.5 x 13.5 km^2 at the center of the swath. Level 3 daily and monthly data are composed by using best quality level 2 pixels at resolution of both 0.5°x0.5° and 1.0°x1.0°. Focusing on the southwest Asia region, this presentation shows seasonal variations of AOD, and the result of comparisons for 5 years (2003-2007) of AOD from SWDB (Version 3) and MODIS Aqua (Version 5.1) with the Dark Target (MYD-DT) and Deep Blue (MYD-DB) algorithms. The dataset is available from the NASA Goddard Earth Sciences Data and Information Services Center (GES DISC) at http://disc.gsfc.nasa.gov/measures/.

Seasonal Variations of Aerosols over Southwest Asia

SeaWiFS mission-averaged AOD at 550nm.
(Grey color indicates very low aerosols.)

The image to the left is the mission-averaged SWDB AOD at 550nm, illustrating the global distribution of aerosols. The time series (right plot) shows AOD over the southwest Asia region, which is significantly higher than both the global and northern hemisphere average.

Lower images show seasonal variations of AOD at 550nm over the southwest Asia region. The aerosols over this region are from both local sources and long-range transport. The largest aerosol loadings appear during the summer, and are mostly associated with dust transported from Arabian Peninsula by the southwest summer monsoon. Data sampling is low during summer over India due to very high cloudiness.
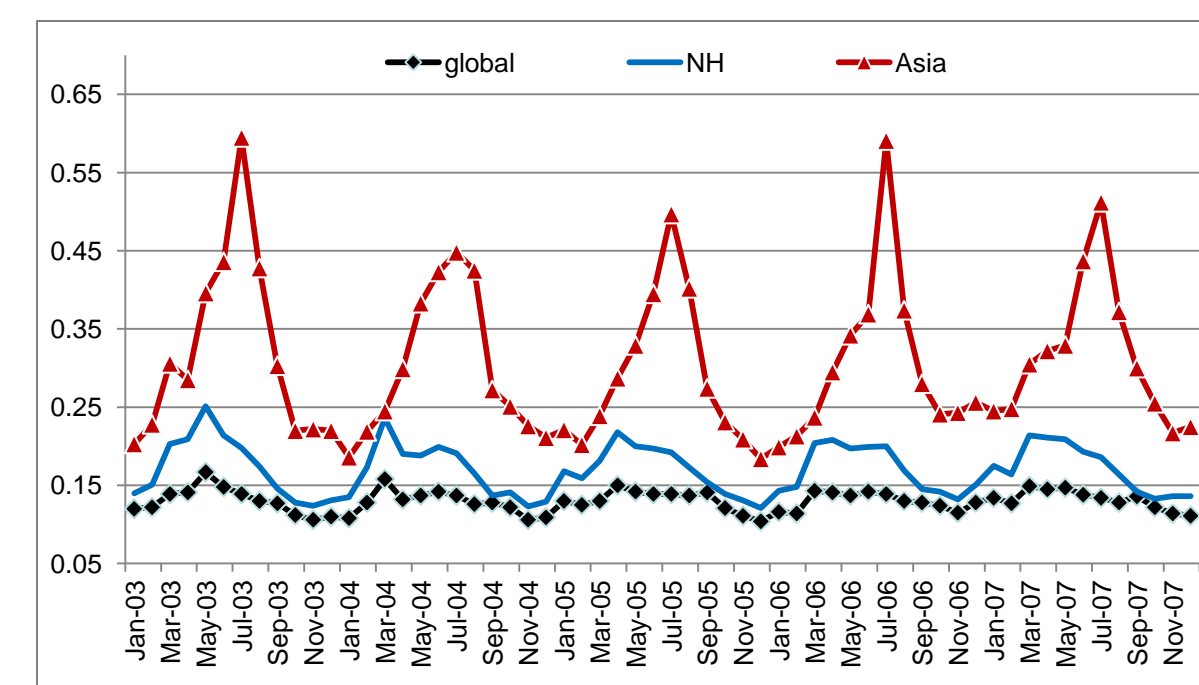

Area averaged monthly SeaWiFS Deep Blue AOD at 550 nm, calculated with Giovanni.
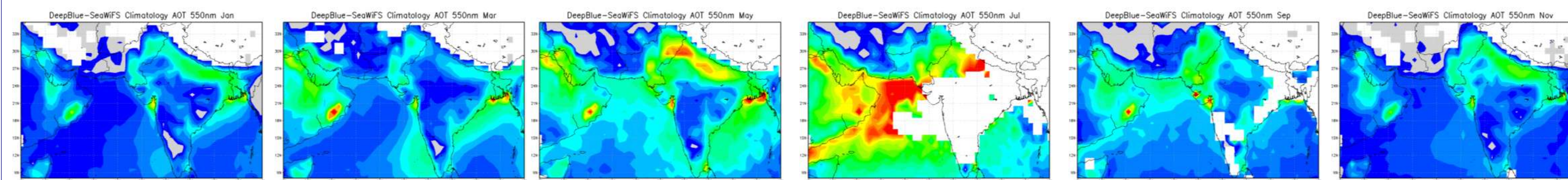
Comparisons with Aerosols from MODIS
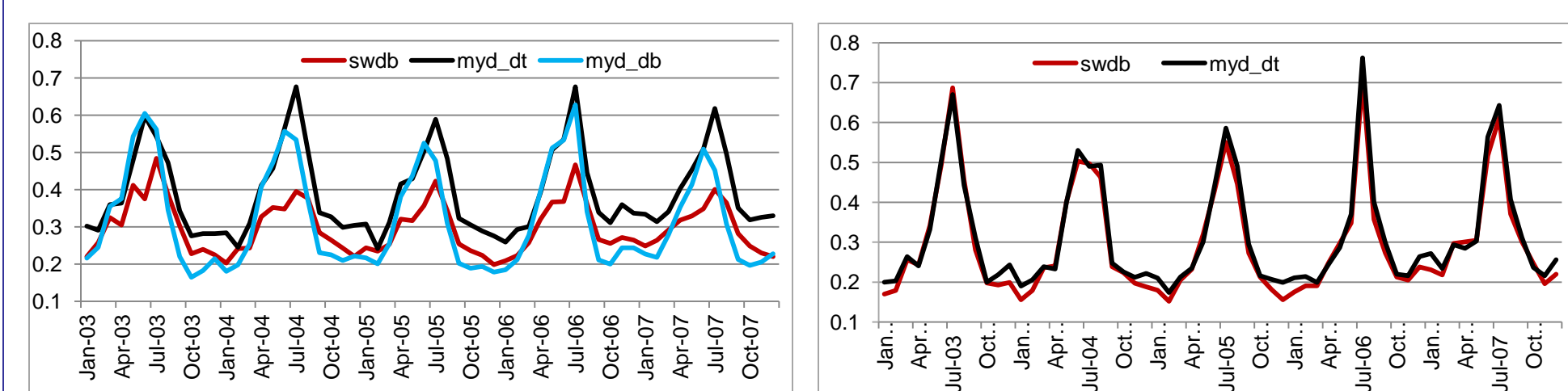
Time series are monthly AOD at 550nm (upper panels) and valid data points (lower panels), from SWDB (red), MYD-DB (blue), and MYD-DT (black) over land (left panels) and over ocean (right panels) over southwest Asia (45°E-90°E, 8°N-35°N). The differences are small over the ocean and, in general, are less than 0.1 over land except for summer, which may be partially due to significantly lower sampling during the monsoon rainfall season.
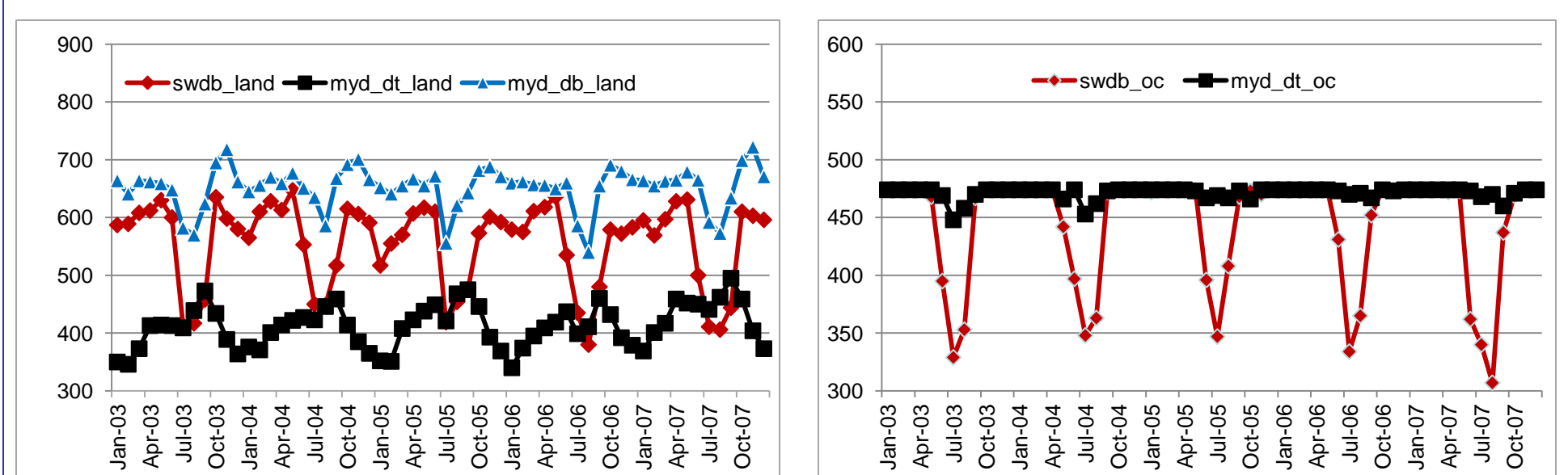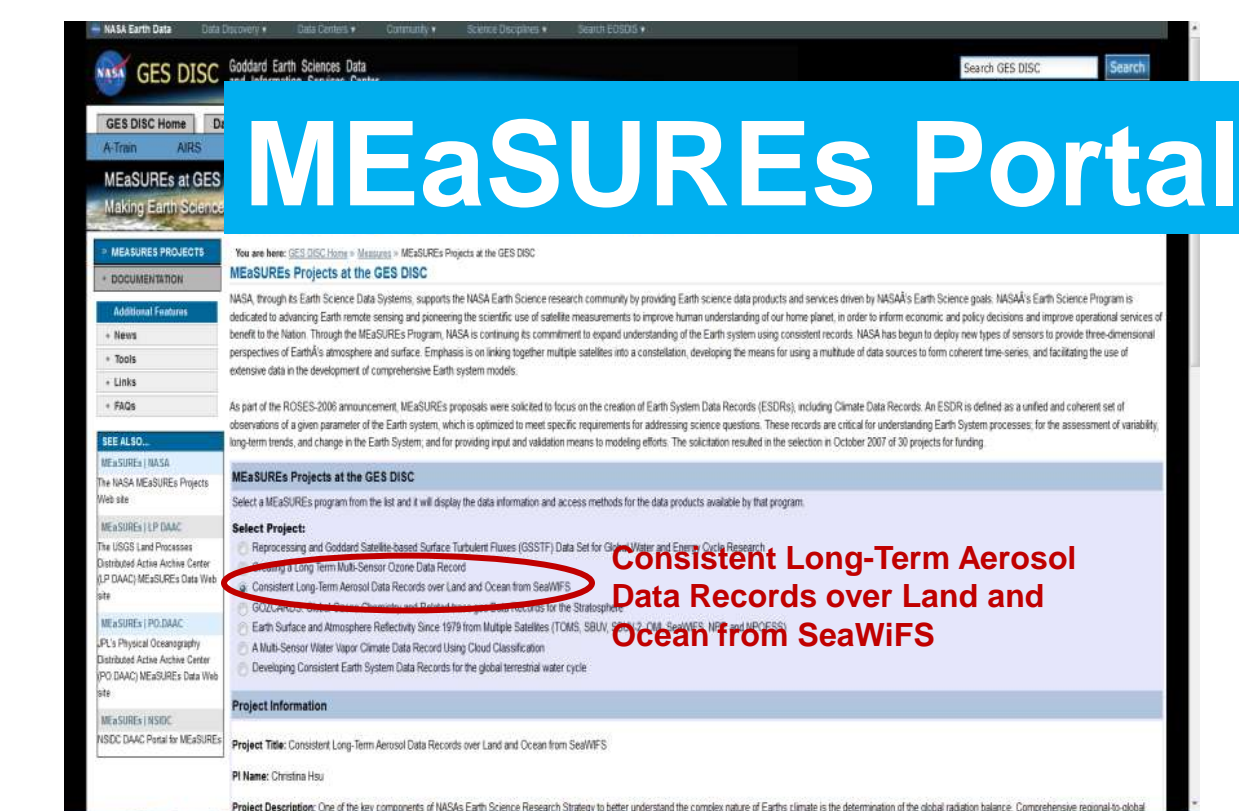

Spatial patterns of differences of AOD between SWDB and MYD-DT (upper panels) or MYD-DB (lower panels) for Jan, Apr, Jul, and Oct (from left to right), respectively. Interestingly, these differences show seasonal variation with larger differences in the spring and summer. SWDB is significantly lower than both MYD-DT and MYD-DB over India during pre-monsoon season. Over land in July, the number of matching data points between SWDB and MODIS (in particular MYD-DT) is very low, which may cause artifacts in calculating an area mean.

Where and How to Obtain SeaWiFS Deep Blue Aerosols Data

SeaWiFS Deep Blue (SWDB) aerosol products are one of seven MEaSUREs products archived and distributed at NASA GES DISC:

http://disc.gsfc.nasa.gov/measures/

Data format: HDF5
Coverage: 1997.09 – 2010.12

Product Name	Processing	Resolution	File Size (MB)
SWDB_L2.003	Level 2 swath	13.5 km	5.1
SWDB_L305.005	Level 3 daily	0.5 Deg	7.6
SWDB_L310.003	Level 3 daily	1 Deg	2.4
SWDB_L3M05.003	Level 3 monthly	0.5 Deg	15.0
SWDB_L3M10.003	Level 3 monthly	1 Deg	4.4

Data Services:
- ✓ Mirador
- ✓ Reverb
- ✓ GCMD
- ✓ OPeNDAP
- ✓ Giovanni
- ✓ Direct FTP

Search Data in Mirador

Mirador is a search and order Web tool at the NASA GES DISC. It has a drastically simplified, clean interface and employs the Google mini appliance for metadata Keyword and Time searches. Other features include project navigation, and semantic oriented parameter navigation based on science areas.

Data Distributions

Visualization and Analysis with Giovanni

http://disc.gsfc.nasa.gov/giovanni/
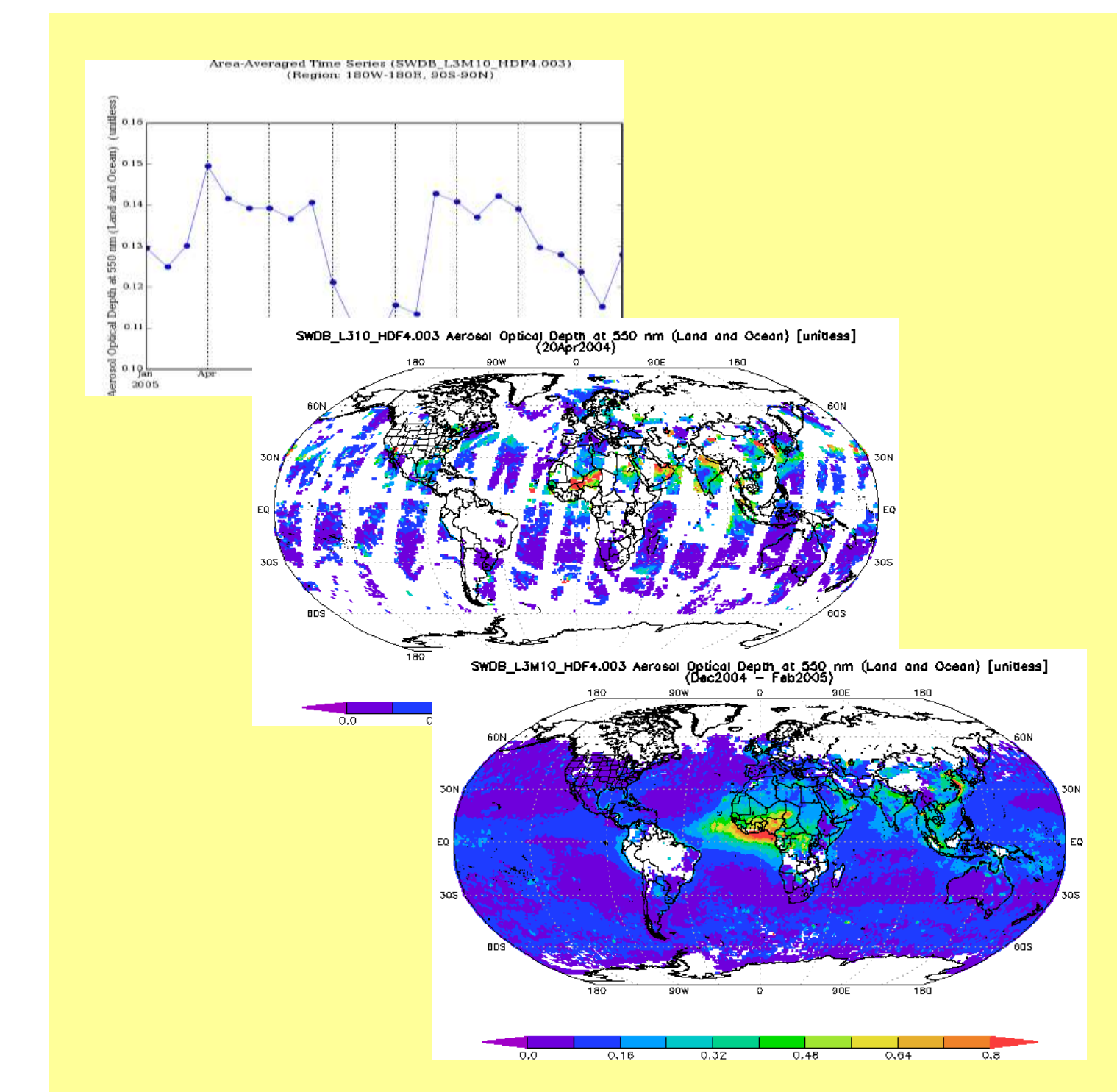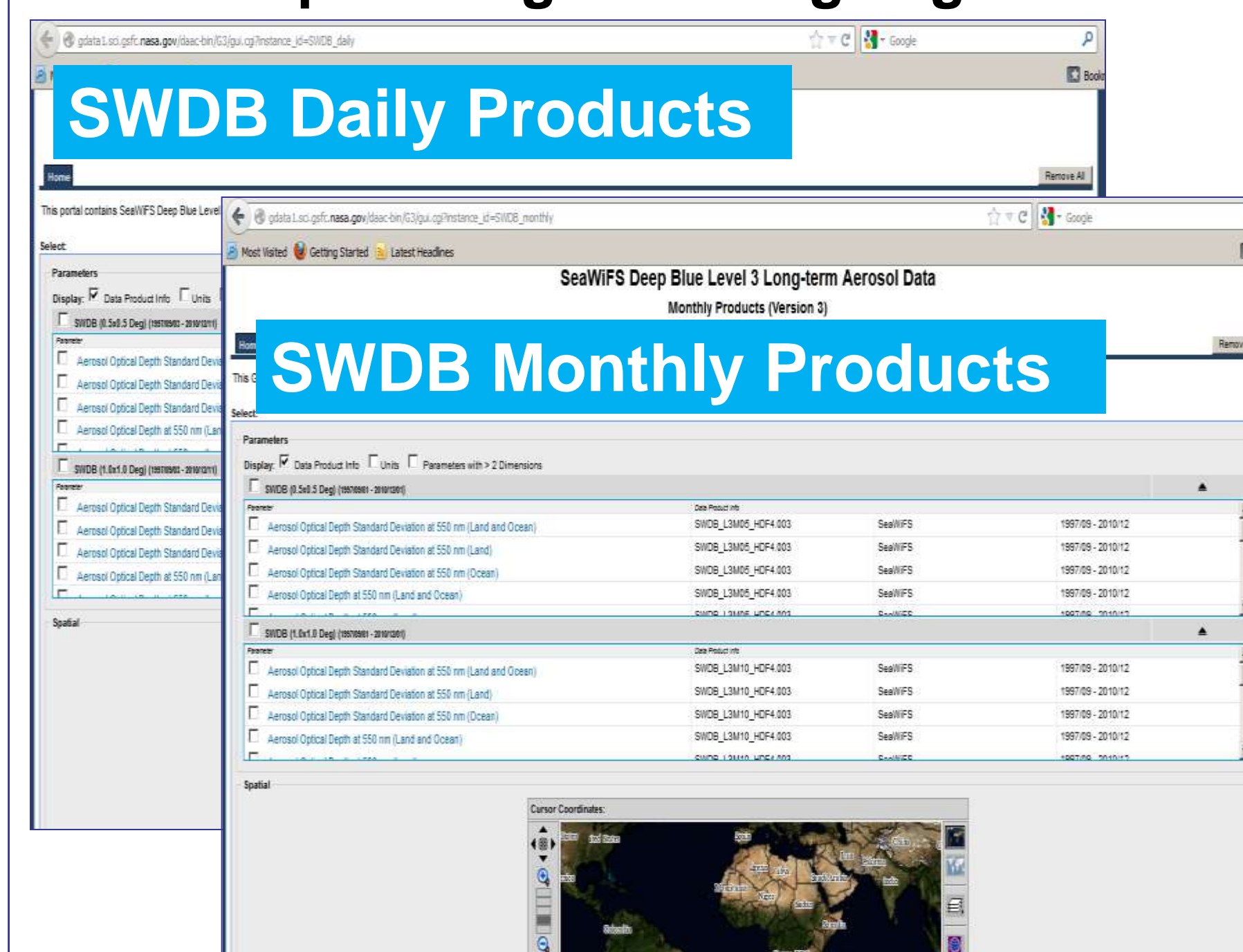
Visualization Features:
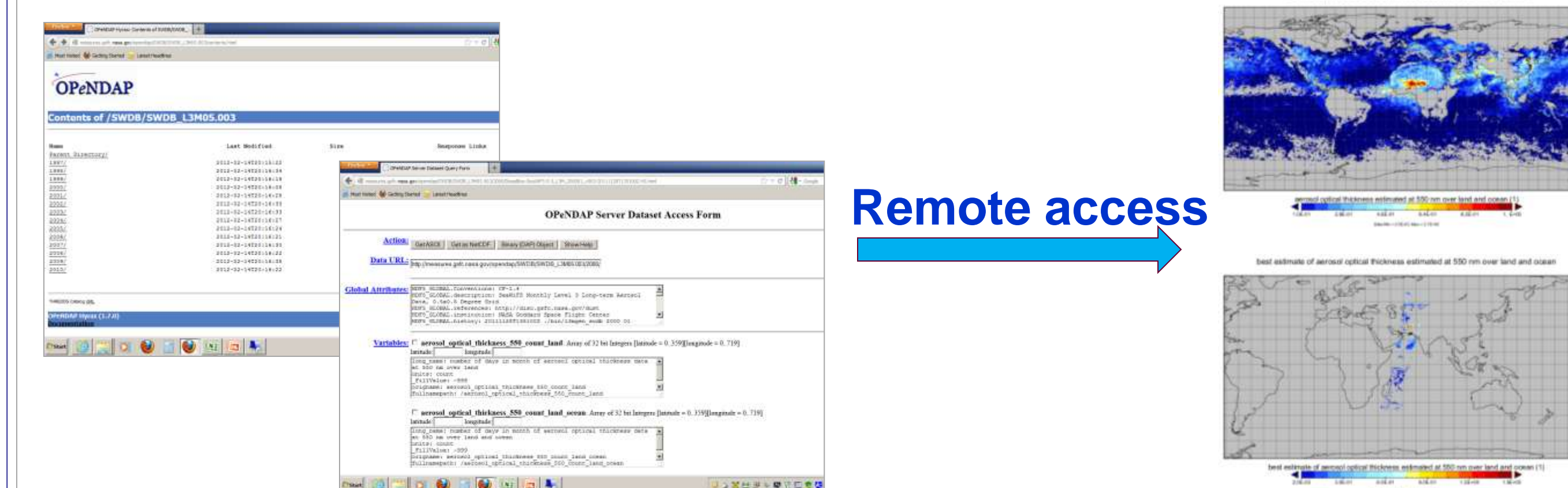
Single Parameter Exploration:
- Lat–Lon area plots of time-averaged parameters
- Time-series plots of area-averaged parameters
- Animations of consecutive Lat–Lon area plots

Multi-parameter Intercomparison:
- Time-series plots of multiple parameters
- Time-series of two-parameter differences
- Lat–Lon area plot of two-parameter differences
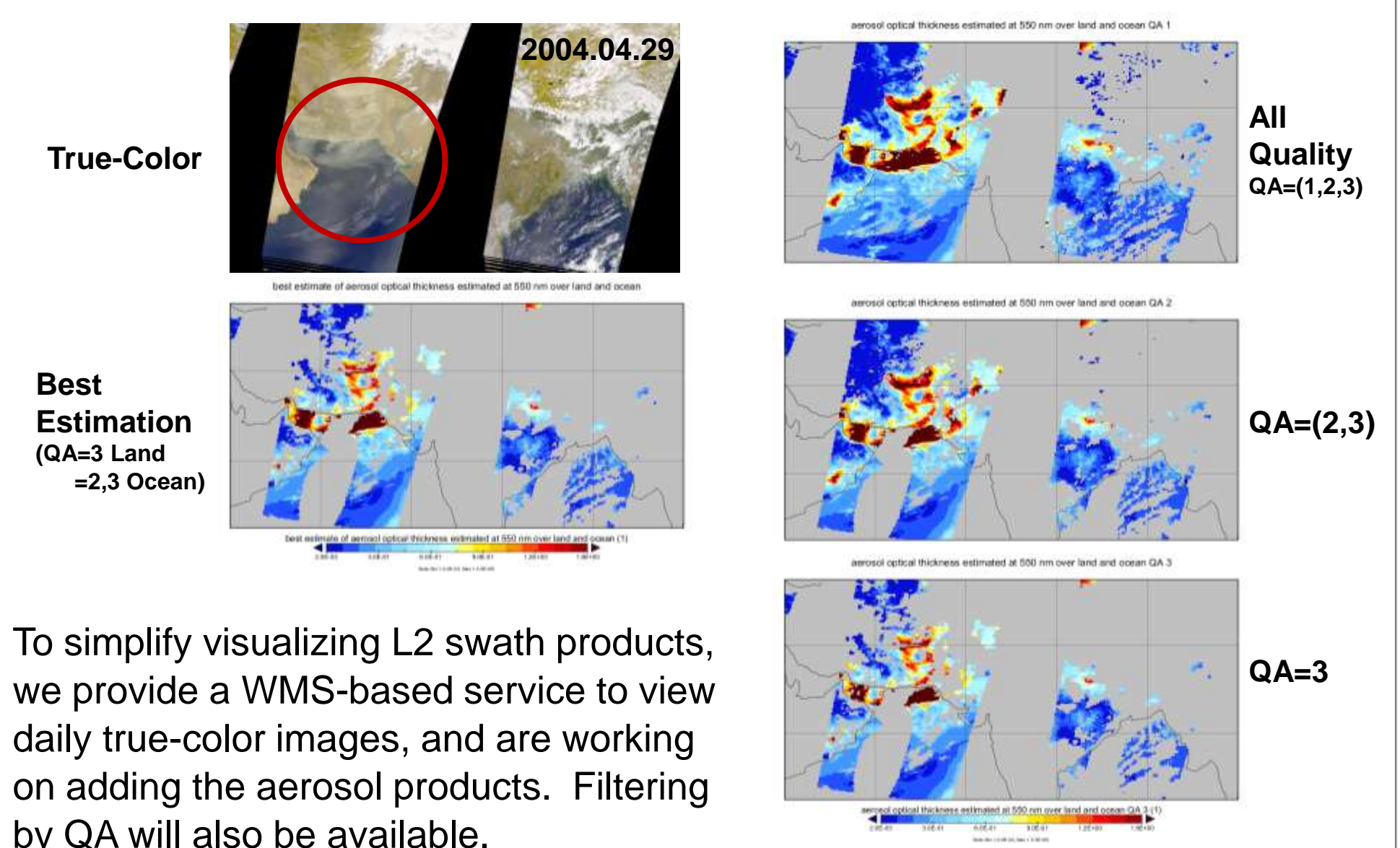- Scatter plots with regression statistics

Download:
- Data in formats: ASCII, HDF, netCDF
- Image: GIF, PNG, KMZ for Google Earth

Accessing Data in OPeNDAP

OPeNDAP has been added recently to serve SWDB products for increasing the interoperability of the data. A user is able to access the data remotely with applications, such as Panoply, GrADS, IDV, and Ferret, etc.

Remote access

True-color and L2 Images Viewer

To simplify visualizing L2 swath products, we provide a WMS-based service to view daily true-color images, and are working on adding the aerosol products. Filtering by QA will also be available.

References:
[1] Sayer, A. M., N. C. Hsu, C. Bettenhausen, Z. Ahmad, B. N. Holben, A. Smirnov, G. E. Thomas, and J. Zhang (2012), SeaWiFS Ocean Aerosol Retrieval (SOAR): Algorithm, validation, and comparison with other data sets, J. Geophys. Res., 117, D03206, doi:10.1029/2011JD016599.
[2] Sayer, A. M., Hsu, N. C., Bettenhausen, C., Jeong, M.-J., Holben, B. N., and Zhang, J.: Global and regional evaluation of over-land spectral aerosol optical depth retrievals from SeaWiFS, Atmos. Meas. Tech., 5, 1761-1778, doi:10.5194/amt-5-1761-2012, 2012.